



UNIDAD EDUCATIVA MONTE TABOR – NAZARET
Área de Matemáticas
Guía de ejercicios propuestos
Examen del 2do Quimestre

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NOMBRE: _____ CURSO: II Bach.

1. Consider the four numbers a, b, c, d with $a \leq b \leq c \leq d$, where $a, b, c, d \in \mathbb{Z}$.
 The mean of the four numbers is 4.
 The mode is 3.
 The median is 3.
 The range is 6.

Find the value of a , of b , of c and of d .

(Total 6 marks)

2. A set of data is

18, 18, 19, 19, 20, 22, 22, 23, 27, 28, 28, 31, 34, 34, 36.

The box and whisker plot for this data is shown below.



- (a) Write down the values of A, B, C, D and E.

A = B = C = D = E =

- (b) Find the interquartile range.

(Total 6 marks)

3. A standard die is rolled 36 times. The results are shown in the following table.

Score	1	2	3	4	5	6
Frequency	3	5	4	6	10	8

- (a) Write down the standard deviation.

(2)

- (b) Write down the median score.

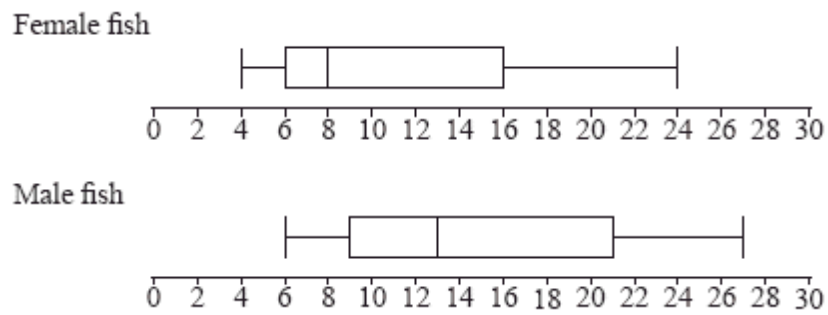
(1)

- (c) Find the interquartile range.

(3)

(Total 6 marks)

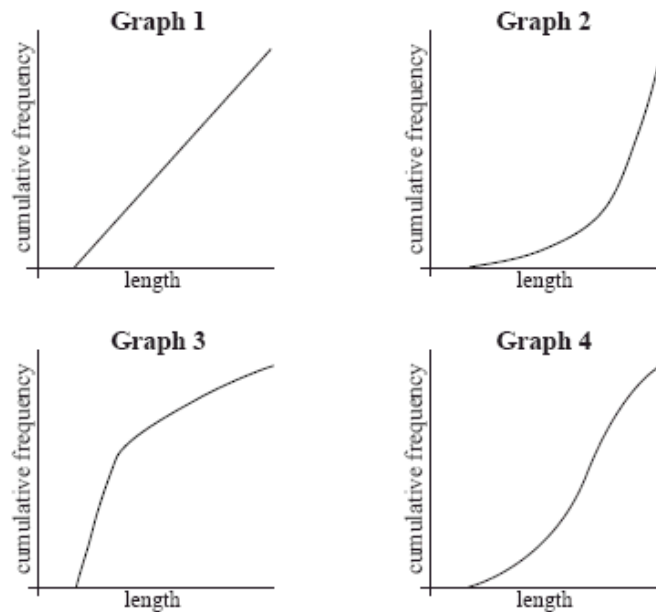
4. A scientist has 100 female fish and 100 male fish. She measures their lengths to the nearest cm. These are shown in the following box and whisker diagrams.



- (a) Find the range of the lengths of **all** 200 fish.

(3)

- (b) Four cumulative frequency graphs are shown below.

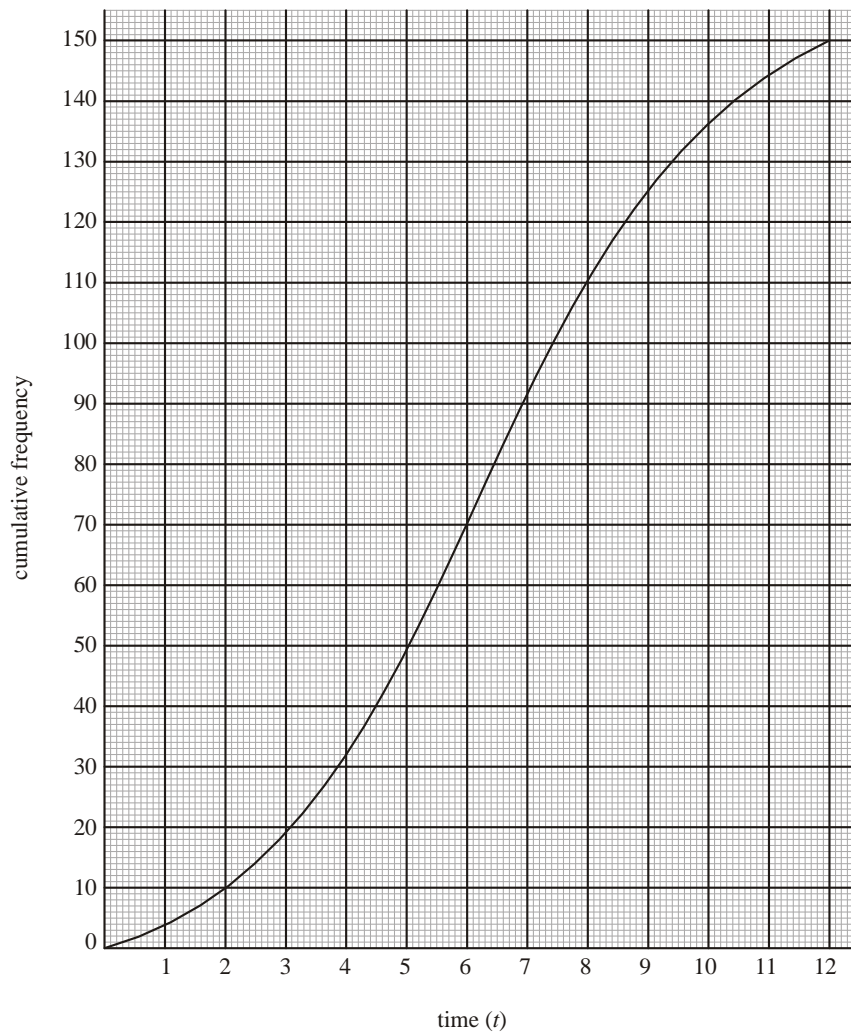


Which graph is the best representation of the lengths of the **female** fish?

(2)

(Total 5 marks)

5. The following is the cumulative frequency curve for the time, t minutes, spent by 150 people in a store on a particular day.



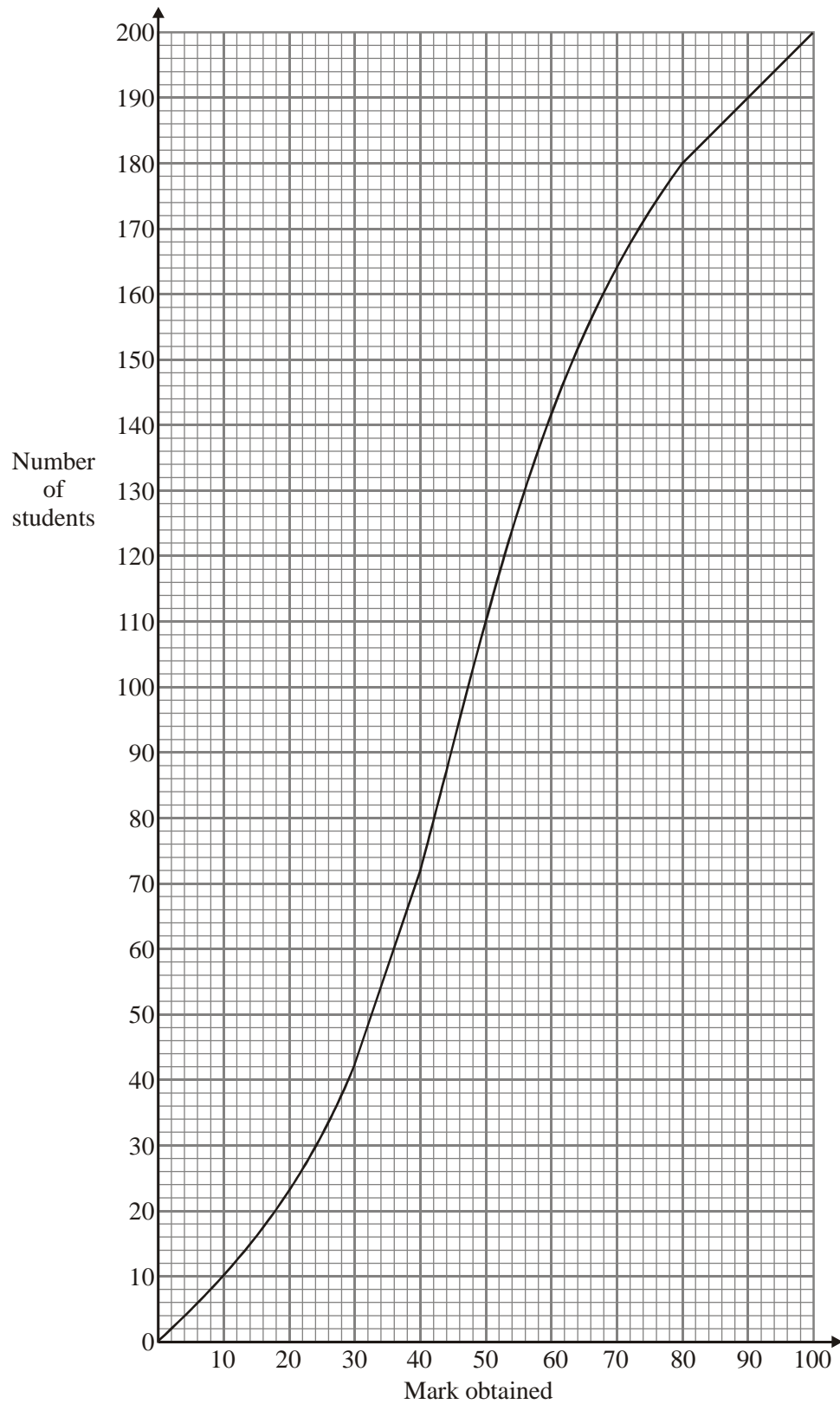
- (a) (i) How many people spent less than 5 minutes in the store?
- (ii) Find the number of people who spent between 5 and 7 minutes in the store.
- (iii) Find the median time spent in the store. (6)
- (b) Given that 40% of the people spent longer than k minutes, find the value of k . (3)
- (c) (i) **On your answer sheet**, copy and complete the following frequency table.

t (minutes)	$0 \leq t < 2$	$2 \leq t < 4$	$4 \leq t < 6$	$6 \leq t < 8$	$8 \leq t < 10$	$10 \leq t < 12$
Frequency	10	23				15

- (ii) Hence, calculate an estimate for the mean time spent in the store.

(5)
(Total 14 marks)

6. The cumulative frequency curve below shows the marks obtained in an examination by a group of 200 students.



- (a) Use the cumulative frequency curve to complete the frequency table below.

Mark (x)	$0 \leq x < 20$	$20 \leq x < 40$	$40 \leq x < 60$	$60 \leq x < 80$	$80 \leq x < 100$
Number of students	22				20

- (b) Forty percent of the students fail. Find the pass mark.

Working:

Answer:

(b)

(Total 6 marks)

7. The probability distribution of a discrete random variable X is given by

$$P(X = x) = \frac{x^2}{14}, x \in \{1, 2, k\}, \text{ where } k > 0.$$

- (a) Write down $P(X = 2)$.

(1)

- (b) Show that $k = 3$.

(4)

- (c) Find $E(X)$.

(2)

(Total 7 marks)

8. A discrete random variable X has a probability distribution as shown in the table below.

x	0	1	2	3
$P(X = x)$	0.1	a	0.3	b

- (a) Find the value of $a + b$.

(2)

- (b) Given that $E(X) = 1.5$, find the value of a and of b .

(4)

(Total 6 marks)

9. The following table shows the probability distribution of a discrete random variable X .

x	-1	0	2	3
$P(X = x)$	0.2	$10k^2$	0.4	$3k$

- (a) Find the value of k .

(4)

- (b) Find the expected value of X .

(3)

(Total 7 marks)

10. A fair coin is tossed eight times. Calculate

- (a) the probability of obtaining exactly 4 heads;

(2)

- (b) the probability of obtaining exactly 3 heads;

(1)

- (c) the probability of obtaining 3, 4 or 5 heads.

(3)

(Total 6 marks)

- 11.** A factory makes calculators. Over a long period, 2 % of them are found to be faulty. A random sample of 100 calculators is tested.

(a) Write down the expected number of faulty calculators in the sample.

(1)

(b) Find the probability that three calculators are faulty.

(2)

(c) Find the probability that more than one calculator is faulty.

(3)

(Total 6 marks)

- 12.** Evan likes to play two games of chance, A and B.

For game A, the probability that Evan wins is 0.9. He plays game A seven times.

(a) Find the probability that he wins exactly four games.

(2)

For game B, the probability that Evan wins is p . He plays game B seven times.

(b) Write down an expression, in terms of p , for the probability that he wins exactly four games.

(2)

(c) Hence, find the values of p such that the probability that he wins exactly four games is 0.15.

(3)

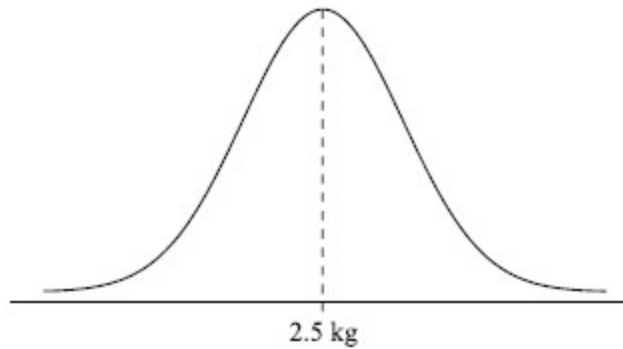
(Total 7 marks)

- 13.** The heights of a group of students are normally distributed with a mean of 160 cm and a standard deviation of 20 cm.
- (a) A student is chosen at random. Find the probability that the student's height is greater than 180 cm.
- (b) In this group of students, 11.9% have heights less than d cm. Find the value of d .
(Total 6 marks)
- 14.** The mass of packets of a breakfast cereal is normally distributed with a mean of 750 g and standard deviation of 25 g.
- (a) Find the probability that a packet chosen at random has mass
- (i) less than 740 g;
- (ii) at least 780 g;
- (iii) between 740 g and 780 g.
(5)
- (b) Two packets are chosen at random. What is the probability that both packets have a mass which is less than 740 g?
(2)
- (c) The mass of 70% of the packets is more than x grams. Find the value of x .
(2)
(Total 9 marks)
- 15.** The heights of certain flowers follow a normal distribution. It is known that 20% of these flowers have a height less than 3 cm and 10% have a height greater than 8 cm.
- Find the value of the mean μ and the standard deviation σ .
(Total 6 marks)

16. The weights of chickens for sale in a shop are normally distributed with mean 2.5 kg and standard deviation 0.3 kg.

(a) A chicken is chosen at random.

- (i) Find the probability that it weighs less than 2 kg.
- (ii) Find the probability that it weighs more than 2.8 kg.
- (iii) Copy the diagram below. Shade the areas that represent the probabilities from parts (i) and (ii).



- (iv) **Hence** show that the probability that it weighs between 2 kg and 2.8 kg is 0.7936 (to four significant figures).

(7)

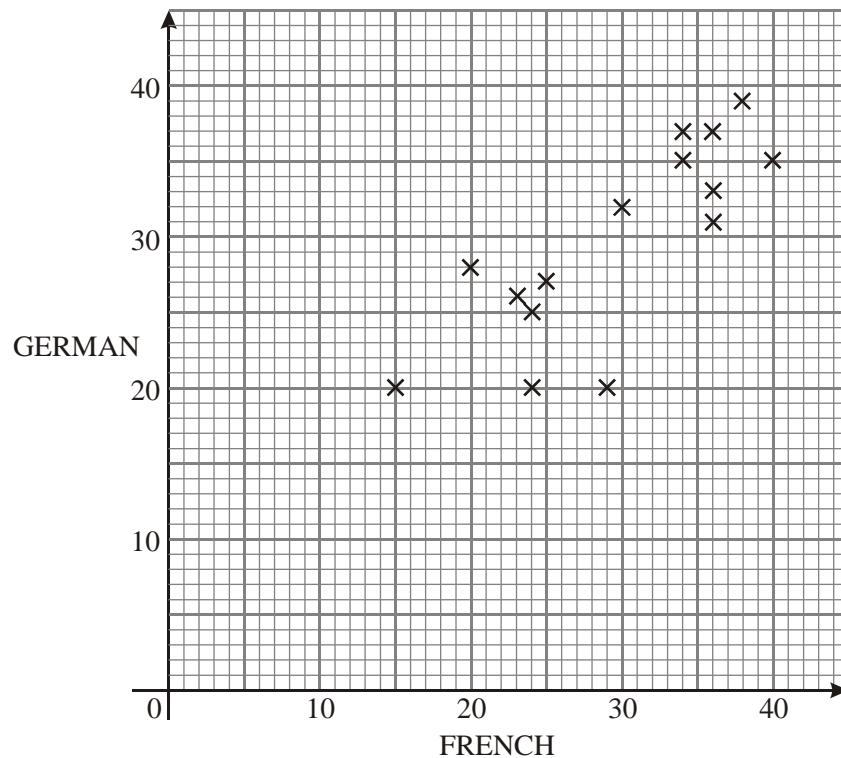
(b) A customer buys 10 chickens.

- (i) Find the probability that all 10 chickens weigh between 2 kg and 2.8 kg.
- (ii) Find the probability that at least 7 of the chickens weigh between 2 kg and 2.8 kg.

(6)

(Total 13 marks)

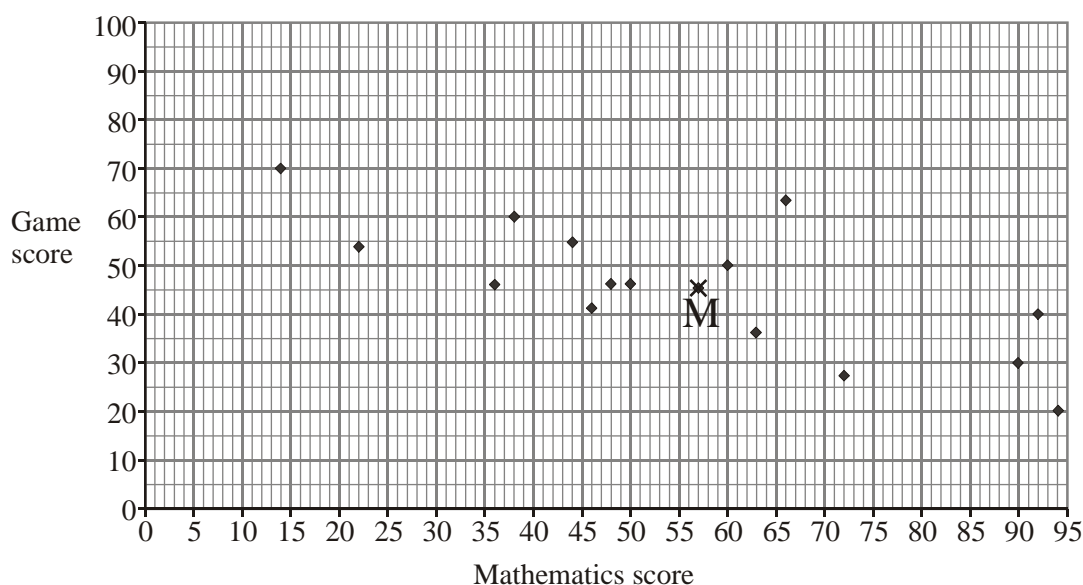
17. The diagram below shows the marks scored by pupils in a French test and a German test. The mean score on the French test is 29 marks and on the German test is 31 marks.



- Describe the relationship between the marks scored in the two tests.
- On the graph mark the point M which represents the mean of the distribution.
- Draw a suitable line of best fit.
- Idris scored 32 marks on the French test. Use your graph to estimate the mark Idris scored on the German test.

(Total 4 marks)

18. A group of 15 students was given a test on mathematics. The students then played a computer game. The diagram below shows the scores on the test and the game.



The mean score on the mathematics test was 56.9 and the mean score for the computer game was 45.9. The point M has coordinates (56.9, 45.9).

- (a) Describe the relationship between the two sets of scores.

A straight line of best fit passes through the point (0, 69).

- (b) On the diagram draw this straight line of best fit.

Jane took the tests late and scored 45 at mathematics.

- (c) Using your graph or otherwise, estimate the score Jane expects on the computer game, giving your answer to the nearest whole number.

(Total 8 marks)

19. The heat output in thermal units from burning 1 kg of wood changes according to the wood's percentage moisture content. The moisture content and heat output of 10 blocks of the same type of wood each weighing 1 kg were measured. These are shown in the table.

Moisture content % (x)	8	15	22	30	34	45	50	60	74	82
Heat output (y)	80	77	74	69	68	61	61	55	50	45

- (a) Draw a scatter diagram to show the above data. Use a scale of 2 cm to represent 10 % on the x -axis and a scale of 2 cm to represent 10 thermal units on the y -axis. (4)

- (b) Write down

(i) the mean percentage moisture content, \bar{x} ;

(ii) the mean heat output, \bar{y} .

(2)

- (c) Plot the point (\bar{x}, \bar{y}) on your scatter diagram and label this point M. (2)

- (d) Write down the product-moment correlation coefficient, r . (2)

The equation of the regression line y on x is $y = -0.470x + 83.7$.

- (e) Draw the regression line y on x on your scatter diagram. (2)

- (f) Estimate the heat output in thermal units of a 1 kg block of wood that has 25 % moisture content. (2)

- (g) State, with a reason, whether it is appropriate to use the regression line y on x to estimate the heat output in part (f). (2)

(Total 16 marks)

20. A shop keeper recorded daily sales s of ice cream along with the daily maximum temperature $t^{\circ}\text{C}$. The results for one week are shown below.

t	29	31	34	23	19	20	27
s	104	92	112	48	56	72	66

- (a) Write down the equation of the regression line for s on t . (3)

- (b) Use your equation to predict the ice cream sales on a day when the maximum temperature is 24°C . Give your answer correct to the nearest whole number. (3)

(Total 6 marks)

21. The *Type Fast* secretarial training agency has a new computer software spreadsheet package. The agency investigates the number of hours it takes people of varying ages to reach a level of proficiency using this package. Fifteen individuals are tested and the results are summarised in the table below.

Age (x)	32	40	21	45	24	19	17	21	27	54	33	37	23	45	18
Time (in hours) (y)	10	12	8	15	7	8	6	9	11	16	t	13	9	17	5

- (a) (i) Given that $S_y = 3.5$ and $S_{xy} = 36.7$, calculate the product-moment correlation coefficient r for this data. (4)

- (ii) What does the value of the correlation coefficient suggest about the relationship between the two variables? (1)

- (b) Given that the mean time taken was 10.6 hours, write the equation of the regression line for y on x in the form $y = ax + b$. (3)

- (c) Use your equation for the regression line to predict
- (i) the time that it would take a 33 year old person to reach proficiency, giving your answer correct to the nearest hour; (2)
- (ii) the age of a person who would take 8 hours to reach proficiency, giving your answer correct to the nearest year. (2)

(Total 12 marks)

22. Marty asked some of his classmates to rate their level of stress out of 10, with 10 being very high. He also asked them to measure the number of minutes it took them to get from home to school. A random selection of his results is listed below.

Travel time (x)	13	24	22	18	36	16	14	20	6	12
Stress rating (y)	3	7	5	4	8	8	4	8	2	6

- (i) Write down the value of the (linear) coefficient of correlation for this information. (1)
- (ii) Explain what a positive value for the coefficient of correlation indicates. (1)
- (iii) Write down the linear regression equation of y on x in the form $y = ax + b$ (2)
- (iv) Use your equation in part (iii) to determine the stress rating for a student who takes three quarters of an hour to travel to school. (2)
- (v) Can your answer in part (iv) be considered reliable? Give a reason for your answer. (2)
- (Total 8 marks)**